Operator: Ashland Oil and Refining Co.
Farm: Youngstown Mines Corp.
Well No.: 1-4147
Location: Tazewell County
1000' S of 37°10'
7000' W of 81°45'
Elevation: 2994.7'
Total Depth: 5900'
Remarks: Elevation and location of well site with reference to: coal geology along Big Creek and Middle Creek Basins; measured section No. 333; the Seng Camp core 3 miles north; Polecat Branch core 5 mile northwest; and the Town Hill core 4 1/2 miles southwest; indicate that the core spudded in about 380' above the Upper Seaboard coal. Depths below are measured from K.B. 10 feet above ground level.

Formation	Top	Bottom	Thickness
Pennsylvanian System			
New River Formation "in at surface"		1305	1305'
		Upper Seaboard coal 355-360'	
		Middle Seaboard coal 437-440'	
		Lower Seaboard coal 500-505'	
		Upper Horsepen coal 690-695'	
		Middle Horsepen coal 740-745'	
		"C" Seam or War Creek coal 920-925'	
		War Creek coal 955-957'	
		Lower Horsepen coal 1137-1140'	
		Pocahontas #8 coal 1298-1300'	
Pocahontas Formation	1305	2090	785'
		Flat Top Sand Interval 1305-1360'	55'
		Pocahontas #7 coal 1405-1407'	
		Pocahontas #6 coal 1464-1466'	
		Pocahontas #5 coal 1560-1565'	
		Pocahontas #4 coal 1613-1615'	
		Pocahontas #3 coal 1690-1692'	
		Pocahontas #2 coal 1877-1880'	
		Pocahontas #1 coal 1897-1899'	

Correlations by Marshall Miller, 1970-74, VDMR.

Bluestone Formation	2090	2615	525'
Pride Shale	2420	2615	195'
Princeton Interval	2615	2785	170'
Little Stone Gap Mem.	2785	2980	195'
*Greenbrier Formation	4450	5195	745'
*Maccrady	5195		

*Determined from geophysical well logs.

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Well No.: 1-4147
Location: Tazewell County
100' S of 37°10'
7000' W of 81°45'
Elevation: 2994.7'
Total Depth: 5900'
Remarks: Geologic log by Marshall S. Miller, 1970-71, VDMR, cuttings are from an air rotary; powderly and contaminated throughout.

Depth	Thickness	Description
0- 85	85'	Sandstone, light tan, orange and brown, very fine grained, silty, micaceous, obviously weathered
85-110	25'	Siltstone, light gray, micaceous
110-130	20'	Shale, gray to dark gray, silty, pebbly
130-175	45'	Shale, gray, brittle, fissile
175-185	10'	Shale, dark gray and black, carbonaceous
185-190	5'	Shale, gray, silty
190-205	15'	Shale, light gray, finely micaceous, silty with minor amounts of white, fine grained sandstone
205-225	20'	Sandstone, light gray, fine to medium, sub-rounded, moderately sorted, with abundant muscovite, biotite, chlorite, phlogopite, hematite, and traces of feldspar, abundant clay and silt matrix material, 55% quartz, 5% feldspar, 20% matrix, 20% rock and mineral fragments
225-300	75'	Sandstone, light gray to white, very fine to medium grained, subround, poorly sorted, micaceous with muscovite, chlorite and biotite, traces of feldspar and hematite, considerable amount of clay and silt matrix material
300-310	10'	Shale, gray, silty, finely micaceous

310-321	10'	Sandstone, light gray, fine grained, silty, micaceous
321-350	29'	Shale, dark gray, silty
350-355	5'	Sandstone, gray, fine to very fine grained, silty
355-360	5'	Coal, silty, impure
360-437	77'	Shale, dark gray to black, silty, locally carbonaceous
437-440	3'	Coal
440-475	35'	Shale, as in 360-437
475-500	25'	Sandstone, gray to light gray, fine to medium grained, subround to subangular, interstitially silty, with abundant muscovite, biotite, chlorite, and coaly fragments, traces of feldspar, minor amounts of gray siltstone
500-505	5'	Coal
505-585	80'	Sandstone, light gray to white, very fine to medium grained, subangular, poorly sorted, with scattered large muscovite flakes, carbonaceous material, and considerable amount of clay and silt matrix material, 80% quartz, 15% matrix, 5% rock and mineral fragments
585-636	51'	Siltstone, gray, finely micaceous, argillaceous, locally carbonaceous
636-643	7'	Coal
643-660	17'	Siltstone, as in 585-636
660-690	30'	Sandstone, light gray, very fine to fine grained, subrounded, well sorted, with abundant muscovite, biotite, chlorite, and coaly material, traces of feldspar, small amount of clay matrix, 65% quartz
690-695	5'	Coal, good show, high luster, pure

695-715	20'	Sandstone, light gray, fine to medium grained, subround to subangular, poorly sorted, with abundant clay-silt matrix, muscovite, biotite, chlorite, hematite, dark carbonaceous material, and traces of feldspar, about 55% quartz
715-725	10'	Siltstone, dark gray
725-730	5'	Coal, silty, impure
730-740	10'	Siltstone, black, carbonaceous
740-745	5'	Coal, dull luster, silty
745-765	20'	Sandstone, gray, fine grained, silty, with minor amounts of dark gray, carbonaceous shale and siltstone
765-825	60'	Siltstone, gray, shaly, micaceous
825-920	95'	Sandstone, white, fine grained, subrounded, well sorted, with only rare muscovite, chlorite, limonite stains and carbonaceous material, variable amounts of clay-silica matrix material, and occasionally a rare purple or violet fine grained mineral, about 80 to 85% quartz, 5 to 10% matrix, 5% rock and mineral fragments
920-925	5'	Coal, good show, high luster
925-945	20'	Sandstone, gray, very fine to fine grained, moderately well sorted, with abundant clay and silt matrix and finely dispersed carbonaceous material
945-955	10'	Shale, black, carbonaceous
955-957	2'	Coal
957-987	30'	Sandstone, light gray, fine to medium grained, subround to subangular, moderately sorted, with abundant muscovite, chlorite, hematite, carbonaceous fragments, traces of feldspar
987-990	3'	Coal, silty, dull luster, impure

990-1007	17'	Siltstone, light gray, siliceous
1007-1009	2'	Coal
1009-1035	26'	Sandstone, light gray, fine grained, subround, moderately well sorted, interstitially silty, with varying amounts of muscovite, biotite, chlorite, coaly material, and traces of feldspar, 60% quartz
1035-1070	35'	Shale, dark gray, silty, locally carbonaceous
1070-1130	60'	Sandstone, light gray, fine to medium grained, subrounded, moderately sorted, with abundant clay and silt matrix material, muscovite, biotite, chlorite, coaly material, and reddish iron minerals, traces of feldspar, 55 to 60% quartz
1130-1137	7'	Shale, black, carbonaceous, with plant fossils
1137-1140	3'	Coal
1140-1150	10'	Shale, as in 1130-1137
1150-1175	25'	Siltstone, gray, shaly, carbonaceous
1175-1195	20'	Sandstone, light gray, fine to medium grained, subround to subangular, moderately sorted, considerable clay matrix material, rare muscovite and feldspar, 75 to 80% quartz
1195 1230	35'	Siltstone, dark gray, locally carbonaceous
1230-1270	40'	Sandstone, light gray, fine to medium grained, subround, moderately sorted, small amounts of muscovite, biotite, chlorite, coaly material, considerable clay-silt matrix material, 65% quartz
1270-1298	28'	Siltstone, gray to dark gray, locally carbonaceous
1298-1300	2'	Coal
1300-1305	5'	Siltstone, as in 1270-1298

1305-1360	55'	Sandstone, gray, fine grained, silty, micaceous, with lesser amounts of gray siltstone
1360-1405	45'	Siltstone, dark gray, argillaceous, micaceous
1405-1407	2'	Coal
1407-1425	18'	Siltstone, dark gray, carbonaceous
1425-1464	39'	Siltstone, light gray, siliceous
1464-1466	2'	Coal
1466-1515	49'	Siltstone, light gray, siliceous
1515-1535	20'	Sandstone, light gray, very fine grained, silty, micaceous, with lesser amounts of gray siltstone
1535-1560	25'	Siltstone, light gray, coarse grained, siliceous
1560-1565	5'	Coal, silty
1565-1590	25'	Siltstone, dark gray, carbonaceous
1590-1613	23'	Shale, dark gray, silty, locally carbonaceous, locally calcareous
1613-1615	2'	Coal
1615-1690	75'	Interbedded; sandstone, siltstone, and shale; sandstone, light gray, fine grained, silty, micaceous, with finely dispersed coal fragments; siltstone, gray to light brown, hard and brittle; shale, dark gray, carbonaceous
1690-1692	2'	Coal
1692-1805	113'	Interbedded; as in 1615-1690
1805-1825	20'	Sandstone, gray, very fine grained, silty, very micaceous, with abundant muscovite, biotite, chlorite, phlogopite, coaly material, dark rock fragments, and considerable feldspar, 50% quartz, 10% feldspar

1825-1877	52'	Sahle, dark gray, silty, locally carbonaceous, occasional slickensided surfaces are present
1877-1880	3'	Coal
1880-1847	17'	Shale, as in 1825-1877
1897-1899	2'	Coal, good show, high luster
1899-1945	46'	Siltstone, brownish gray, pebbly, hard, brittle, calcareous
1945-1950	5'	Coal
1950-2005	55'	Sandstone, gray to brownish gray, very fine grained, well rounded, well sorted, abundant calcareous clay matrix, material, dark rock fragments, rare muscovite, rare feldspar, 65% quartz
2005-2090	85'	Sandstone, light gray, fine to medium grained, subround to subangular, poorly sorted, with scattered muscovite, biotite, chlorite, phlogopite, coal fragments, traces of feldspar, and abundant calcareous clay matrix
2090-2170	80'	Shale, red, green, gray, generally calcareous, with minor amounts of brown argillaceous limestone, and gray, calcareous sandstone
2170-2200	30'	Shale, red, calcareous
2200-2370	170'	Shale, red, green, greenish gray, locally silty, generally calcareous, with rare calcite and pyrite, and lesser amounts of brown, argillaceous limestone
2370-2420	50'	Sandstone, gray to light green, very fine grained, calcareous, with lesser amounts of red and green, calcareous shales, rare carbonaceous material
2420-2500	80'	Shale, dark gray to black, finely micaceous, locally carbonaceous and silty

2500-2700	200'	No samples; gamma ray log indicates the shale lithology continues to 2617'
2500-2617	117'	Shale, see gamma ray log
2617-2643	26'	Sandstone, see gamma ray log
2643-2655	12'	Shale, see gamma ray log
2655-2672	17'	Sandstone, see gamma ray log
2672-2685	13'	Shale, see gamma ray log
2685-2720	35'	Sandstone, see gamma ray log
2720-2790	70'	Sandstone, white, quartzose, fine to coarse grained, with occasional conglomeratic pebbles, subangular to subround, moderately to poorly sorted, little to no matrix material, 95 to 100% quartz
2790-2810	20'	Shale, gray, calcareous, silty, finely micaceous
2810-2820	10'	Limestone, grayish brown, argillaceous, impure
2820-2900	80'	Shale, gray, calcareous
2900-2980	80'	Limestone, gray to grayish brown, argillaceous with marine fossil shell fragments and crinoid stems, lesser amounts of gray calcareous shale
2980		Shale, red, green, and gray, silty, calcareous

VDMR Well No. : W-1475

Remarks (cont.)

Initial gas flow 33,000 after fracturing 5828 - 5832' and 5810 - 5840'

Shows of Coal:

437-440, 636-643, 692-695, 742-745, 794-797, 870-872, 925-930, 955-957, 987-990, 1007-1009, 1137-1140, 1298-1300, 1405-1407, 1424-1426, 1464-1466, 1821-1825, 1877-1880, 1897-1899'

Logs Run:

Gamma Ray-Neutron
Temperature